

**DETERMINATION OF THERMAL
PROCESSES ALLOWED UNDER
REGULATION 555/92
INCINERATION BAN**

A GUIDANCE DOCUMENT

NOVEMBER 1994



**Ministry of
Environment
and Energy**

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Determination of thermal processes allowed under Regulation 555/92 incineration ban.

Purpose.

The purpose of this document is to provide the evaluation criteria used for the classification of technologies as incineration or non-incineration and to assist proponents as well as staff of the ministry in determining whether a proposed thermal process is subject to the ban on municipal waste incinerators.

The Ministry of Environment and Energy (MOEE) has banned the construction of future municipal waste (MW) incineration facilities by filing Regulation 555/92 which amends Regulation 347. Relevant excerpts from Regulation 347 "General - Waste Management Regulation" as amended can be found in appendix A. For the purpose of the ban, municipal waste is defined as all wastes covered by Ontario Regulation 347 (formerly O.Reg 309) with the exception of hazardous, liquid industrial and gaseous wastes. This means that non-hazardous solid industrial wastes are included in the ban along with commercial wastes.

The ministry adopted this ban because incineration competes with waste reduction efforts, produces potentially harmful air emissions and transfers the impact of pollutants from one medium to another. The ministry continues to receive applications and inquiries regarding processes that involve incineration or heat processing such as ones for foundry sand reclamation, for the cleanup of gasoline-contaminated soil and for tire pyrolysis where thermal processing is claimed to be part of a waste reduction, reuse or recycling activity. (Pyrolysis involves heating up a waste material with minimal or no air present, so that the organic part of the waste material is turned into gases.)

A thermal process which utilizes municipal waste must be classified either as an **incineration** or as a **non-incineration** process. A proponent - that is, the person making the proposal - is expected to carry out this classification in consultation with staff of the ministry.

Incineration of municipal wastes for the purpose of disposal and/or energy production is subject to the ban. Therefore, the purpose of the proposed thermal process is the basis for determining whether or not the proposal is subject to the ban. Evaluation of the purpose of the thermal process is done by ministry staff.

Traditional descriptions of the three main types of thermal processes - mass burn, pyrolysis and destructive distillation - can be found in appendix B.

Background.

In April 1991, the government banned all future municipal waste incinerators in Ontario. This policy position was based on three principles:

1). Promotion of the conserver society

Incineration of municipal waste is counter to the government's principle of promoting a conserver society by supporting reduction, reuse and recycling efforts with an emphasis on the reduction of the amount of waste. If incineration facilities are readily available, then efforts to find new ways to reduce the generation of waste will be discouraged. Furthermore, manufacturers will be less inclined to ensure that their products are recyclable. As well, incinerators often compete directly for waste products that can be reused and recycled. The ban ensures this competition does not occur. The implementation of a comprehensive 3Rs program means that much of the waste that traditionally would have fuelled incinerators will be reused, recycled or composted or will not be generated in the first place.

The ban on future municipal waste incinerators reinforces the principle that reuse, recycling, composting and source reduction must be priorities.

2). Consideration of multi-media effects

Incineration, in which a solid waste is converted into a gaseous waste for release into the environment, would conflict with the principle that wastes should not be transferred from one medium to another (for example, from land to air) as a means of disposal of the waste.

3). Pollution prevention

Incineration runs counter to the ministry's principle of pollution prevention since incinerators release contaminants into the air and may generate fly ash which is leachate toxic - that is, fly ash which would produce leachate with concentrations of chemicals exceeding the limits set out in Reg. 347.

Exemptions from the ban.

The amending regulation (555/92) allows incineration of waste wood without preservatives, municipal sewage sludge, as well as pulp and paper mill sludges, including deinking sludges. Animal carcasses which are not classified as pathological waste and small quantity exempted wastes (under Reg. 347's hazardous waste definition, clauses p to u and under the liquid

industrial waste definition, clause d) can also be incinerated. Although incineration of these wastes is permissible, the ministry always will insist that as much waste as possible be diverted from disposal through 3Rs activities.

Evaluation criteria.

A thermal process¹ involving municipal waste is prohibited if:

1. the weight of all products which will be recycled or reused is less than 50 per cent of the dry weight of the waste feed to the thermal process (fuel and material for processing into fuel are not considered recycling products);

OR

2. the process produces a residue (solids collected from the process at any stage, such as ashes) for disposal, which is a leachate toxic waste, as defined in Regulation 347, and which weighs three per cent or more of the dry weight of the waste fed into the process.

In determining whether or not a thermal process is an incineration process, **only** the actual waste fed into, and products, fuels and residues which come out of the thermal processing unit will be considered. If there are products or waste materials from a prior recycling operation, those products or materials cannot be included in the evaluation of the thermal process. If non-waste materials are added to the waste materials which are fed to the thermal processing unit, then only the waste materials can be considered in the evaluation of the thermal process.

Byproduct fuels, in gaseous, liquid, or solid forms, can be produced in some thermal processes. These fuels are not to be considered a part of the recycled stream in the thermal process addressed in the first criterion.

The 50 per cent cutoff level was selected as indicative of incineration as any thermal process having more fuel and/or waste product than this level is considered to be primarily for disposal/energy production (as opposed to recycling). Such a process would be subject to the ban.

¹ Thermal process: any process that utilizes heat to accomplish a physical and/or chemical change in the waste material.

In the second criterion, residue includes non-reusable materials such as those that are landfilled, or that are non-marketable. Residue is not limited to these materials.

Some municipal waste, such as domestic waste, when incinerated, produces fly ash which is usually leachate toxic. The fly ash in conventional incineration processes usually represents three per cent of the weight of the waste fed into incineration process. Consequently, three per cent is the criterion limit.

Generic evaluation examples.

Various forms have been prepared as guidance to the type of information required for an evaluation of a thermal process.

The process evaluation summary form and mass balance form (appendix C) address technical evaluation criteria.

Generic examples of completed process evaluation summary forms are included in appendix D.

Examples 1 and 8 describe facilities where waste is used to fuel a kiln process with ash being incorporated into the kiln product.

In example 2, cases 1 and 2 show how a similar process with different levels of recycling would be classed alternately as incineration or recycling.

The third example is a gasification application while example 4 shows how an integrated recycling/incineration plant is handled.

Example 5 is a foundry sand application, example 6 is soil cleaning and example 7 is for thermal processing of car shredder fluff.

Example 9 is a metals recovery process where hazardous fly ash is produced.

The data are for illustrative purposes only and although the mass balance data are typical, data from a proponent may vary, depending on the specific project.

Information required for process evaluation.

Prior to the construction of a new thermal facility, the proponent must obtain a Certificate of Approval (C of A) under Section 9 of the *Environmental Protection Act* (EPA) for a

discharge of contaminants to the natural environment. Part V approval (waste disposal site), for general waste processing and/or disposal, and other MOEE approvals may be necessary.

It is strongly recommended that, at an early stage and prior to formally applying for a C of A, the proponent contact the Approvals Branch for a pre-submission consultation. The Approvals Branch will then coordinate the participation of regional/district offices and other ministry branches as required.

During the pre-submission consultation the ministry will require the following documentation signed by an authorized representative of the proponent:

- 1) A mass balance form with documentation to substantiate the figures used (see appendix C for the mass balance form and the process evaluation summary form);
- 2) Recycled product chemical analysis and/or byproduct specification with a market specification for comparison;
- 3) Letter(s) of intent from proposed customers of recycled materials.

The proponent should not submit an application for a C of A until after staff of the ministry have indicated that the proposed thermal process is not subject to the incinerator ban.

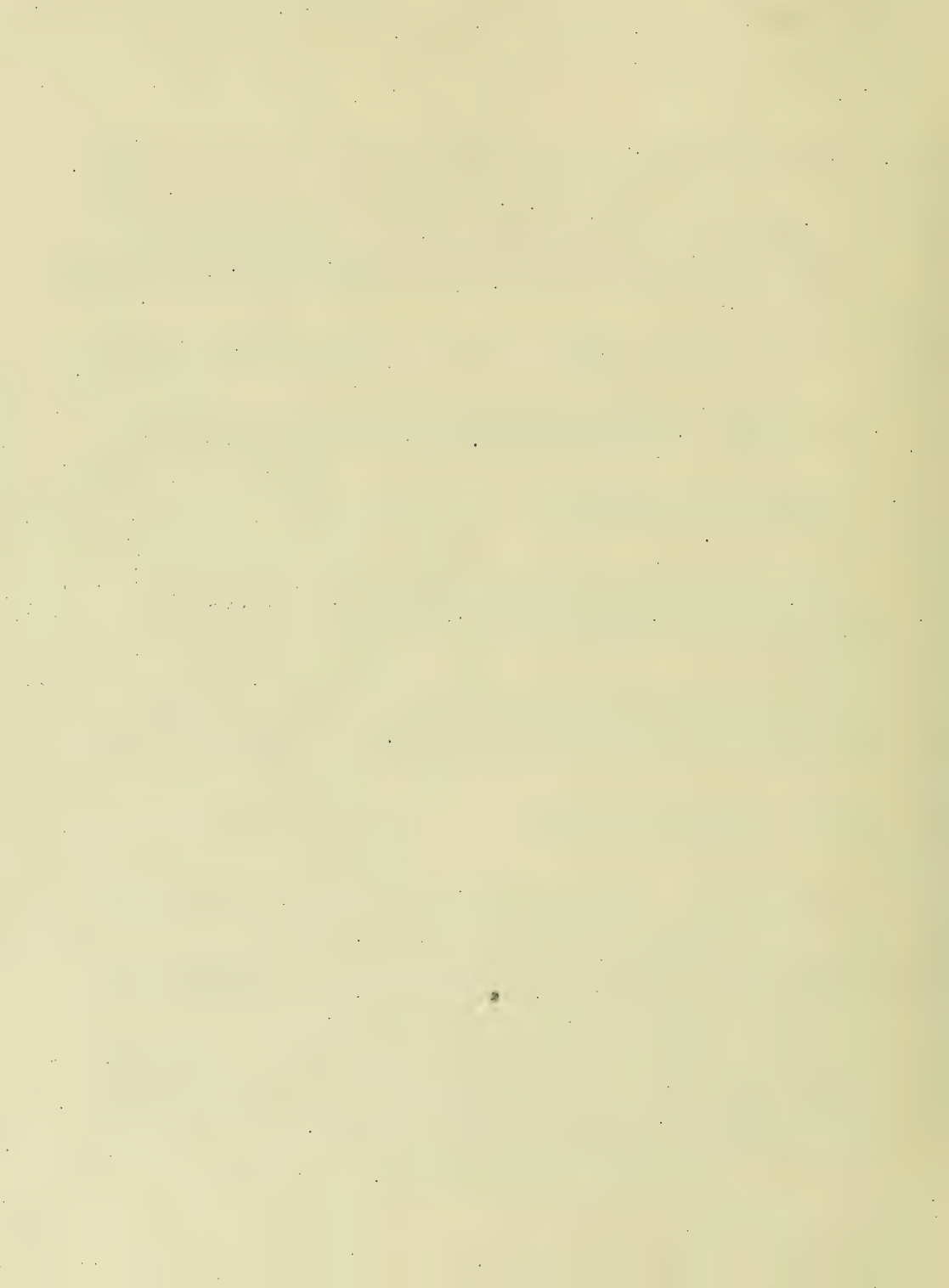
When a thermal process is not subject to the incineration ban, a formal application for approval (Section 9 and Part V of EPA) must include all necessary information required on the application form and in the two guides for applying for a C of A listed in appendix E.

Criteria compliance monitoring.

Monitoring of compliance with the criteria will commence after the commissioning period.

It is recognized that seasonal variations will occur in waste feed quantities/qualities and markets for the sale or reuse of recyclable material. Consequently, a 12-month average, calculated each month to include the previous 11 months, will be used to determine compliance with criteria 1 and 2.

The proponent shall maintain records for two years of all calculations used to show compliance with the criteria. Calculations are to be based only upon total quantities of waste received versus total quantity of recyclable material sold or reused (dry basis). Records are to be made available to the ministry on request.



APPENDIX A

**Excerpts from Ontario Regulation 347 Relative to the Ban on Municipal
Solid Waste Incineration as Amended by Regulation 555/92 and
Subsequent Regulations**

Excerpts from Regulation 347

1. **"municipal waste"** means,
 - (a) any waste, whether or not it is owned, controlled or managed by a municipality, except,
 - (i) hazardous waste,
 - (ii) liquid industrial waste, or
 - (iii) gaseous waste, and
 - (b) solid fuel, whether or not it is waste, that is derived in whole or in part from the waste included in clause (a); O. Reg. 555/92, s. 1.
1. **"municipal waste incinerator site"** means a waste disposal site which accepts municipal waste for incineration; O. Reg. 555/92, s. 1.
1. **"hazardous industrial waste"** means a generic or specific waste listed in Schedule 1 but does not include a waste listed in Schedule 1.1; O. Reg. 240/92, s. 2.
1. **"hazardous waste"** means a waste that is a,
 - (a) hazardous industrial waste,
 - (b) acute hazardous waste chemical,
 - (c) hazardous waste chemical,
 - (d) severely toxic waste,
 - (e) ignitable waste,
 - (f) corrosive waste,
 - (g) reactive waste,
 - (h) radioactive waste, except radioisotope wastes disposed of in a landfilling site in accordance with the written instructions of the Atomic Energy Control Board,
 - (i) pathological waste,
 - (j) leachate toxic waste, or

- (k) PCB waste as defined in Regulation 362 of Revised Regulations of Ontario, 1990,

and includes a mixture of acute hazardous waste chemical, hazardous waste chemical, hazardous industrial waste, pathological waste, radioactive waste or severely toxic waste and any other waste or material, but does not include,

- (l) hauled sewage,
- (m) waste from the operation of a sewage works subject to the *Ontario Water Resources Act* where the works,
 - (i) is owned by a municipality,
 - (ii) is owned by the Crown subject to an agreement with a municipality under the *Ontario Water Resources Act*, or
 - (iii) receives only waste similar in character to the domestic sewage from a household,
- (n) domestic waste,
- (o) incinerator ash resulting from the incineration of waste that is neither hazardous waste nor liquid industrial waste,
- (p) waste that is a hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste and that is produced in any month in an amount less than five kilograms or otherwise accumulated in an amount less than five kilograms,
- (q) waste that is an acute hazardous waste chemical and that is produced in any month in an amount less than one kilogram or otherwise accumulated in an amount less than one kilogram,
- (r) an empty container or the liner from an empty container that contained hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste,
- (s) an empty container of less than twenty litres capacity or one or more liners weighing, in total, less than ten kilograms from empty containers, that contained acute hazardous waste chemical,
- (t) the residues or contaminated materials from the clean-up of a spill of less than five kilograms of waste that is a hazardous industrial waste, hazardous waste

chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste, or

- (u) the residues or contaminated materials from the clean-up of a spill of less than one kilogram of waste that is an acute hazardous waste chemical;

1. **"industrial waste"** means waste from,

- (a) an enterprise or activity involving warehousing, storage or industrial, manufacturing or commercial processes or operations,
- (b) research or an experimental enterprise or activity,
- (c) an enterprise or activity to which clause (a) would apply if the enterprise or activity were carried on for profit,
- (d) clinics that provide medical diagnosis or treatment, or
- (e) schools, laboratories or hospitals;

1. **"liquid industrial waste"** means waste that is both liquid waste and industrial waste but does not include,

- (a) hauled sewage;
- (b) waste from the operation of a sewage works described in clause (m) of the definition of "hazardous waste",
- (c) waste from the operation of a water works subject to the *Ontario Water Resources Act*,
- (d) waste that is produced in any month in an amount less than twenty-five litres or otherwise accumulated in an amount less than twenty-five litres,
- (e) waste directly discharged by a generator from a waste generation facility into a sewage works subject to the *Ontario Water Resources Act* or established before the 3rd day of April, 1957 or into a sewage system, as defined in Part VIII of the Act,
- (f) waste that results directly from food processing and preparation operations, including food packing, food preserving, wine making, cheese making and restaurants,

- (g) drilling fluids and produced waters associated with the exploration, development or production of crude oil or natural gas,
- (h) processed organic waste, or
- (i) asbestos waste;

1. "waste-derived fuel" means a waste that,

- (a) is hazardous waste, liquid industrial waste or waste described in clauses (p), (q), (r), (s), (t) and (u) of the definition of hazardous waste or in clause (d) of the definition of liquid industrial waste,
- (b) contains not more than 5 milligrams per kilogram arsenic, not more than 2 milligrams per kilogram cadmium, not more 50 milligrams per kilogram lead, not more than 2 milligrams per kilogram PCBs (as defined in Regulation 362 of Revised Regulations of Ontario, 1990) and not more than 1,500 milligrams per kilogram total halogens,
- (c) has a flash point of at least 38° Celsius as determined by the Tag Closed Cup Tester (ASTM D-56-79), the Setaflash Closed Cup Tester (ASTM D-3243-77 or ASTM D-3278-78), the Pensky-Martens Closed Cup Tester (ASTM D-93-79) or an equivalent test method approved by the Director,
- (d) has a quality as fuel not worse than commercially available low grade fuel and,
- (e) is located at or destined for a waste-derived fuel site, where it will be wholly utilized as a fuel or fuel supplement in a combustion unit; O. Reg. 555/92, s. 1.

1. "woodwaste" means waste,

- (a) that is wood or a wood product, including tree trunks, tree branches, leaves and brush,
- (b) that is not contaminated with chromated copper arsenate, ammoniacal copper arsenate, pentachlorophenol or creosote and,
- (c) from which easily removable hardware, fittings and attachments, unless they are predominantly wood or cellulose, have been removed,

but does not include,

- (d) an upholstered article, or
 - (e) an article to which a rigid surface treatment is affixed or adhered, unless the rigid surface treatment is predominantly wood or cellulose;
O. Reg. 555/92, s. 1.
1. **"woodwaste combustor site"** means a waste disposal site where woodwaste is incinerated or wholly utilized as a fuel or fuel supplement in a combustion unit.
O. Reg. 555/92, s. 1.
- 12.1. (1) No municipal waste incinerator site shall be established or operated in Ontario.
O. Reg. 555/92, s. 6.
- 12.1. (2) Subsection (1) does not apply to the establishment or operation of a municipal waste incinerator site at which the only waste incinerated is one or more of the following:
- 1. Woodwaste.
 - 2. Pulp mill sludge.
 - 3. Paper mill sludge.
 - 4. Paper deinking sludge.
 - 5. Animal carcasses which are not pathological waste.
 - 6. Waste described in clause (m) of the definition of "hazardous waste" in section 1.
 - 7. Waste described in clause (p) of the definition of "hazardous waste" in section 1.
 - 8. Waste described in clause (q) of the definition of "hazardous waste" in section 1.
 - 9. Waste described in clause (r) of the definition of "hazardous waste" in section 1.
 - 10. Waste described in clause (s) of the definition of "hazardous waste" in section 1.

11. Waste described in clause (t) of the definition of "hazardous waste" in section 1.
 12. Waste described in clause (u) of the definition of "hazardous waste" in section 1.
 13. Waste described in clause (d) of the definition of "liquid industrial waste" in section 1. O. Reg. 555/92, s. 6.
-
- 12.1. (3) Subsection (1) does not apply to the establishment or operation of a municipal waste incinerator site at which waste other than that listed in subsection (2) is incinerated if,
 - (a) an approval to proceed is given under the *Environmental Assessment Act* with respect to the municipal waste incinerator site on or before the 26th day of September 1992; or
 - (b) a certificate of approval or provisional certificate of approval for the establishment and operation of the municipal waste incinerator site issued under Part V of the *Environmental Protection Act* is in force on the 26th day of September 1992. O. Reg. 555/92, s. 6.
 - 12.1. (4) Subsection (1) does not apply to the operation of a municipal waste incinerator site at which waste other than that listed in subsection (2) is incinerated if,
 - (a) the municipal waste incinerator site was first put into operation before the 26th day of September, 1992; and
 - (b) immediately before the 26th day of September, 1992 no certificate of approval or provisional certificate under Part V of the *Environmental Protection Act* was required for the operation of the municipal waste incinerator site. O. Reg. 555/92, s. 6.
 - 12.1. (5) A municipal waste incinerator site that is exempt, under subsection (4), from the application of subsection (1) ceases to be exempt if the operation of the municipal waste incinerator changes substantially. O. Reg. 555/92, s. 6.
 - 12.1. (6) A municipal waste incinerator site that is exempt, under subsection (3) or (4), from the application of subsection (1) ceases to be exempt at the end of the twelve-month period immediately following the 26th day of September, 1992, if the municipal waste incinerator site is in operation on fewer than thirty days during the twelve month period. O. Reg. 555/92, s. 6.

APPENDIX B

DESCRIPTION OF UNITS.

Description of units.

Mass burn incineration.

There are two kinds of mass burn units in general use: excess air and starved air.

Excess air units normally have only one chamber and generally have a grate system that permits ash movement through the incinerator on a continuous basis. This grate system nearly always has provision to allow underfire air - that is, air fed into the process under the grate - to ensure good burnout of the ash. Residues of less than one per cent carbon are possible with some units. In addition to the underfire air, the units also have provision to regulate quantities overfire air (air fed into the thermal process above the grate) in order to ensure complete combustion of any volatile gases released from the grate zone. Normally an excess air unit will use two to 2.5 times the minimum amount of air required for complete burning of the waste.

Starved air units generally have two chambers: a primary chamber where the waste is partially burned (using approximately 60 per cent of the minimum amount of air required for complete burning) in order to provide the heat to evaporate the remaining organic matter; extra air is added to a secondary chamber to burn the gases liberated in the first chamber. The primary chamber also normally has a system to move the ash continuously through the chamber but sometimes it does not have provision for adding underfire air. There is residual carbon in the ash which weighs from about 10 to 20 per cent of the weight of the original dry waste feed. Total air usage is generally less than twice the minimum amount of air required for complete burning of the waste. Most of the air is added in the secondary chamber.

Pyrolysis units.

Heating organics in the absence of air or with a restricted air or oxygen supply results in the organics being turned into gases. Pyrolysis products differ with the temperature of the process. Metallurgical coke, for example, is made at a high temperature and produces mostly gas; low-temperature coke produces more liquids. If all glass, metals, stones, etc., have been removed, the pyrolysis residue of wood or garbage can be a char of chemical composition similar to anthracite coal and with a similar heating value. It can be used as a fuel, as a sterile filter medium or as a soil conditioner.

Pyrolysis units can be heated either externally or internally - in the latter case by burning a small part of the organic material or in both cases by burning a portion of the gases or oils produced by the process. The capital cost of pyrolysis may be less than that for incineration but the volume reduction is smaller.

Pyrolysis units come in many different forms. Generally provision is made to add heat to drive off gases from the waste while an attempt is made to reduce the entrance of air (oxygen). For

example, wastes are crushed by the hydraulic feed system to reduce empty space prior to entry into the unit or are processed in gaseous nitrogen. Gases are condensed or compressed with some of the flammable ones being used in externally heated retorts to provide more heat to the unit. The amount of heat needed for pyrolysis is some 4000 megajoules per tonne of refuse or about half the weight of the refuse. The char is very high in carbon and may contain polycyclic aromatic hydrocarbons (PAHs) if the temperature achieved was not high enough to remove them.

Destructive distillation.

Destructive distillation is a process which occurs in the absence of oxygen or air. It is a chemical decomposition process which requires heat but does not burn the material.

Waste is placed in a closed, air-free container which then has indirect heat applied. Large organic molecules break down into smaller organic molecules and a carbon char residue. The smaller molecules can be sent to a secondary chamber where they are burned.

APPENDIX C

PROCESS EVALUATION SUMMARY FORM

AND

MASS BALANCE FORM.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (Note: Weights in Nos. 4 to 7 are on a dry basis):

- | | | |
|----|---|---|
| 1. | Weight of material defined by the MOEE as waste fed into the thermal processor | W |
| 2. | Per cent moisture in waste (air dried at 60°C) | M |
| 3. | Weight of dry waste fed into the thermal process
$A = W - (W \cdot M / 100)$ | A |
| 4. | Weight of gaseous products for recycling | B |
| 5. | Weight of liquid products for recycling | C |
| 6. | Weight of solid products for recycling | D |
| 7. | Weight of hazardous residue for disposal | E |

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	Criterion equations	Calculated value
1.	$(B + C + D) / A$	
2.	$E * 100 / A$	

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

Signature.

.....

.....

.....

1. Weight of material defined by MOEE as waste fed into the thermal processor. (W)
Waste quantity actually fed to the unit as opposed to the quantity received at the facility. The waste will generally contain some percentage of moisture.
2. Per cent moisture in waste (air dried at 60°C). (M)
Determining the amount of moisture in a given material is usually done at 60°C, 105°C or some other higher temperature depending upon the industrial methods involved. However, as temperatures are increased, more types of volatiles are driven off. Some industrial methods also may include the use of vacuum and inert gases. The inert gas method also will be acceptable to the ministry if safety considerations demand it (e.g. gasoline-contaminated soil).
3. Weight of dry waste fed into the thermal process. (A)
Weight calculated as though no water were present.
- 4.5.6. Gaseous, liquid or solid products for recycling. (B,C,D)
Those materials that will be reused or sold by the proponent for some purpose which does not include use as a fuel (e.g. oils could be rerefined for lubricating purposes but not for gasoline).
7. Weight of hazardous residue for disposal. (E)
Waste can be hazardous due to ignitability, corrosiveness, reactivity, toxicity, radioactivity, infectiousness or leachate toxicity. Ontario Regulation 347, Schedule 3, deals with severely toxic contaminants and Schedule 4 with leachable toxic contaminants which are the main concern with combustion residues.

MASS BALANCE FORM

Appendix to the Process Evaluation Summary Form for the purpose of determining whether or not a process is subject to the ban on future municipal waste incinerators.

The tables below are examples only and must be modified/expanded as necessary.

Only waste, fuel and air will be considered for process evaluation/classification purposes. If other materials are fed into the process, they must be excluded on the mass balance tables.

This rough mass balance form is used only for classification of the proposed process. Complete heat and mass balance calculations will be required for verification of design process data when the formal application for a certificate of approval is submitted.

IN (ALL STREAMS)

FEED INTO THE PROCESS	UNITS (KILOGRAMS PER HOUR)
WASTE FEED AS FIRED ²	W =
AUXILIARY FUEL FEED (IF ANY)	
AIR FEED (IF ANY)	
TOTAL MATERIALS IN	

² Weight of dry waste feed into the process (A) and per cent moisture in waste feed (M) are required in the process evaluation form. Weight of dry waste feed must be calculated from the waste feed as fired in accordance with the following formula:

$$A = W - (W * M / 100),$$

where W = waste feed as fired and M = per cent moisture by weight in waste feed as fired (air dried at 60°C).

A =	M =
-----	-----

OUT (ALL STREAMS)

Note: Moisture is distributed among all the outgoing streams: gases, liquids as well as solids. However, it may be easier to report moisture separately as in the table below, since heat and mass balance calculations will provide the requested numbers. All weights in the tables for gaseous, liquid and solid materials must be reported on a dry basis.

MOISTURE OUT	UNITS (KILOGRAMS PER HOUR)
MOISTURE IN AIR ³	
MOISTURE IN WASTE ⁴	
MOISTURE FORMED (if any) ⁵	
TOTAL MOISTURE OUT ⁶	

³ MOISTURE IN AIR means the moisture which was contained in the air feed (MIA) into the process and is calculated in accordance with the following formula:

$$MIA = PMA/100 \cdot WA$$

where PMA = per cent moisture by weight in the air feed into the process and WA = weight of air feed into the process.

⁴ MOISTURE IN WASTE means moisture which was contained in the waste feed (MIW) as fired and is calculated in accordance with the following formula:

$$MIW = M/100 \cdot W$$

where M = per cent moisture by weight in waste feed as fired and W = weight of waste feed as fired.

⁵ MOISTURE FORMED means moisture which may be formed during complete or partial oxidation of waste, auxiliary fuel and any byproduct fuel generated in the process. In some processes no moisture may be formed.

⁶ TOTAL MOISTURE OUT means the moisture which is distributed among all outgoing gaseous, liquid and solid streams.

OUT (ALL STREAMS) - continued

GASEOUS MATERIALS OUT	UNITS (KILOGRAMS PER HOUR)
STACK GAS OXYGEN ⁷	
STACK GAS NITROGEN ⁸	
STACK GAS BYPRODUCTS ⁹	
GASEOUS BYPRODUCTS FOR USE AS FUEL (in-plant or sale; specify)	
GASEOUS PRODUCTS FOR RECYCLING ¹⁰ (specify)	B =
TOTAL GASEOUS MATERIALS OUT (on dry basis)	

LIQUID MATERIALS OUT	UNITS (KILOGRAMS PER HOUR)
LIQUID BYPRODUCTS TO BE DISPOSED OF (specify)	
LIQUID BYPRODUCTS FOR USE AS FUEL (in- plant/sale, specify)	
LIQUID PRODUCTS FOR RECYCLING ¹¹ (specify)	C =
TOTAL LIQUID MATERIALS OUT (on dry basis)	

⁷ STACK GAS OXYGEN means the oxygen which is contained in the air feed into the process but which is not consumed in the process, and is discharged into the natural environment as part of the stack gases. Oxygen is reported separately, since the amount is easily obtained from heat and mass balance calculations.

⁸ STACK GAS NITROGEN means the nitrogen which is contained in the air feed into the process but which is not consumed in the process and is discharged into the natural environment as part of the stack gases. Nitrogen is reported separately, since the amount is easily obtained from heat and mass balance calculations.

⁹ STACK GAS BYPRODUCTS include products of complete or incomplete combustion, such as carbon dioxide, carbon monoxide etc., which are discharged into the natural environment as part of the stack gases.

¹⁰ GASEOUS PRODUCTS FOR RECYCLING mean those gaseous products that are not discharged as part of stack gases, but are collected to be used directly as products other than fuel or are used as feedstock into a process which generates products other than fuel; all products for recycling must be non-fuel products.

¹¹ LIQUID PRODUCTS FOR RECYCLING mean those liquid products that are collected and used directly as products other than fuel or are used as feedstock into a process which generates products other than fuel; all products for recycling must be non-fuel products.

OUT (ALL STREAMS) - continued

SOLIDS MATERIALS OUT	UNITS (KILOGRAMS PER HOUR)
SOLID BYPRODUCTS FOR USE AS FUEL (in-plant/sale, specify)	
NON-HAZARDOUS RESIDUE (bottom ash and any other ashes and residues) FOR DISPOSAL	
SOLID PRODUCTS FOR RECYCLING ¹² (specify)	D =
HAZARDOUS RESIDUE (O.REG. 347, Schedules 3 or 4) FOR DISPOSAL	E =
TOTAL SOLID MATERIALS OUT (on dry basis)	
TOTAL MATERIALS OUT	

The process evaluation summary form does not require all the process data which are included in the mass balance tables. The purpose of the mass balance tables is to provide self-auditing worksheets for the weights reported on the process evaluation summary form, since total materials in must equal total materials out.

¹² SOLID PRODUCTS FOR RECYCLING mean those solid products that are collected and used directly as products other than fuel or are used as feedstock into a process which generates products other than fuel; all products for recycling must be non-fuel products.

APPENDIX D

TYPICAL EXAMPLES OF PROCESS EVALUATION SUMMARY FORM.

Example #1

A company wishes to use pyrolysis (heating a waste with little or no air present) on a mixture of municipal waste (MW) (23,000Kg/hr) and clay (38,000Kg/hr) to form a lightweight aggregate. The combustible gases produced from the organic portion of the municipal waste will be burned for process heat with the excess being used for electricity generation. Ash residue (of which the weight is 20 per cent of the MW weight or 3,800Kg/hr) is incorporated into the aggregate as a beneficial material. Other than the clay, all materials used are waste materials that are now generally landfilled. The aggregate product passes the O.Reg 347 Leachate Extraction Procedure but it is assumed that the fly ash (45Kg/hr) does not.

No allowance should be made in the mass balance for the weight of clay used.

The mass balance calculation shows a loss in the weight of the waste of 80 per cent due to burning as fuel. The weight of the residue which will require disposal in a hazardous waste landfill is less than one per cent of the original weight of the waste.

Criterion 1

Weight of material used as fuel	80%
Weight of material disposed of as waste	< 1%
Weight of material recycled or reused	20%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	< 1%
---	------

Decision: Incineration. Fails criterion 1 evaluation condition as total weight of materials for recycling is less than 50 per cent of the total weight of the dry material fed into the thermal process.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 23,000
2. Per cent moisture in waste (air dried at 60°C) M 17.4%
3. Weight of dry waste fed into the thermal process A 19,000

$$A = W - (W * M / 100)$$
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 0
6. Weight of solid products for recycling D 3,800
7. Weight of hazardous residue for disposal E 45

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$3,800 / 19,000 = 0.2$
2.	$E * 100 / A$	$45 * 100 / 19,000 = 0.24$

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

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Example #2 Case 1

A company has done feasibility studies on the pyrolysis of tires using a bench scale unit of an innovative design. Tires are transformed into primary products including steel, fine carbon black, and gases which can be condensed for recycling as chemical feedstocks such as butadiene, simple terpenes and monocyclic aromatics such as benzene and styrene.

In a commercial unit (14,000Kg/hr with four per cent moisture content), non-condensable gases and liquid fuel at 19 per cent (2,500Kg/hr) of the original dry weight of the tires fed to the process would be used as a fuel heat source for the pyrolysis unit or sent to a fuel user.

The non-marketable carbon black yield would weigh 36 per cent (4,900Kg/hr) of the original dry weight of the tires, recyclable steel would be three per cent (400Kg/hr) of the original dry weight and recyclable liquids would make up the difference at 42 per cent (5,600Kg/hr). This liquid is said to consist almost entirely of hydrocarbons and could be rerefined into a non-fuel product. The carbon black is not leachate toxic.

Criterion 1

Weight of material used as fuel (gas and oil)	19%
Weight of material disposed of as waste	36%
Weight of material recycled or reused	45%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	0%
---	----

Decision: Incineration. Fails criterion 1 evaluation condition as total weight of materials to be recycled is less than 50 per cent of the total dry weight of the tires.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

- | | | |
|---|---|--------|
| 1. Weight of material defined by the MOEE as waste fed into the thermal processor | W | 14,000 |
| 2. Per cent moisture in waste (air dried at 60°C) | M | 4% |
| 3. Weight of dry waste fed into the thermal process
$A = W - (W * M / 100)$ | A | 13,440 |
| 4. Weight of gaseous products for recycling | B | 0 |
| 5. Weight of liquid products for recycling | C | 5,600 |
| 6. Weight of solid products for recycling | D | 400 |
| 7. Weight of hazardous residue for disposal | E | 0 |

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$(5600 + 400) / 13440 = 0.45$
2.	$E * 100 / A$	0

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

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Example #2 Case 2

The company described in Case 1 now has improved the efficiency of their process for the pyrolysis of tires using the same bench scale unit with some modifications. Tires are still transformed into primary products including steel, fine carbon black, and gases which can be condensed for recycling such as butadiene, simple terpenes and monocyclic aromatics such as benzene and styrene.

In a commercial unit, non-condensable gases and liquid fuel, now at 14 per cent (2,000Kg/hr) of the original dry weight of the tires fed to the process, would be used as the heat source for the pyrolysis unit or sent to a fuel user.

The non-marketable carbon black yield is now 32 per cent (4,500Kg/hr) of the dry weight of the tires, recyclable steel remains the same, weighing three per cent of the dry weight of the tires, and recyclable liquids make up the difference at 49 per cent (6,900Kg/hr) of the original dry weight. This liquid is said to consist almost entirely of hydrocarbons and will be rerefined into a non-fuel product.

Criterion 1

Weight of material used as fuel (gas and oil)	14%
Weight of material disposed of as waste	32%
Weight of material recycled or reused	54%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	0%
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Decision: Case 2 Non-Incineration. Passes criteria 1 and 2 as the total weight of the material to be recycled is greater than 50 per cent of the total dry weight of the tires and the weight of the hazardous waste is less than three per cent of the original dry weight.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 14,000
2. Per cent moisture in waste (air dried at 60°C) M 4%
3. Weight of dry waste fed into the thermal process A 13,400
 $A = W - (W * M / 100)$
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 6,900
6. Weight of solid products for recycling D 400
7. Weight of hazardous residue for disposal E 0

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$(6900 + 400) / 13400 = 0.54$
2.	$E * 100 / A$	0

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

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Example #3

A company has developed plasma technology for the gasification of municipal wastes or other organic wastes. Although the pilot plant unit uses electricity, a full scale unit (15,000Kg/hr) could produce substantially more electricity through burning a gas byproduct than required for the plant, therefore becoming a non utility generator.

When municipal waste with 25 per cent moisture content is treated, it produces 7,800Kg/hr of byproduct gas (70 per cent of the weight of the waste fed into the plasma thermal process on a dry basis). This is then burned to produce electricity. In addition 3,400Kg/hr of residue (30 per cent of the weight of the dry waste fed into the plasma process) is also produced by the plasma process. This residue is a virtually inert glass-like substance of probable commercial value. There is no leachate toxic fly ash produced.

Criterion 1

Weight of material used as fuel	70%
Weight of material disposed of as waste	0%
Weight of material recycled or reused	30%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	0%
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Decision: Incineration. Fails criterion 1 evaluation condition as total weight of materials to be recycled is less than 50 per cent of the total dry weight of the waste fed into the thermal process.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 15,000
2. Per cent moisture in waste (air dried at 60°C) M 25
3. Weight of dry waste fed into the thermal process A = W - (W*M/100) A 11,200
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 0
6. Weight of solid products for recycling D 3,400
7. Weight of hazardous residue for disposal E 0

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$3,400/11,200 = 0.3$
2.	$E * 100 / A$	0

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

Signature.

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Example #4

A municipality proposes building a 25,000Kg/hr fully integrated, waste management facility which includes recycling, composting and an energy-from-waste plant. The latter will burn only the recycling plant's waste that has no market (20 per cent of total amount of waste coming into the integrated plant) in order to reduce the demand on the municipality's shrinking landfill capacity. This waste has a 25 per cent moisture content. The integrated plant also will send 13 per cent of the maximum amount of incoming waste to landfill as being neither recyclable nor burnable.

For the energy-from-waste plant the feed rate is therefore 5,000Kg/hr. Hazardous fly ash weighs about three per cent (115Kg/hr) of the total weight of the dry feed and bottom ash weighs 27 per cent of the dry feed to the EFW plant. The remainder, 70 per cent, becomes combustion gases from producing the energy which will be used in the composting and recycling processes. Without the EFW portion of the project, the vendor is not able to guarantee costs and the municipality will not proceed with the project.

The following summary allows comparison of the complete plant with just the EFW portion. The integrated plant figures are calculated by combining the weights of materials from both the recycling and the EFW sections of the plant. The weight of the material disposed of includes 13 per cent recycling waste and the fly/bottom ash.

The incineration evaluation relates only to the EFW portion of the plant, which is the thermal process at the facility.

	Integrated Plant	EFW Plant
Criterion 1		
Weight of material used as fuel	15%	70%
Weight of material disposed of as waste	18%	30%
Weight of material recycled or reused	67%	0%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	< 1%	3%
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Decision: Incineration. Fails criterion 1 as the weight of the EFW fuel portion is greater than 50 per cent of the total dry weight of the material fed into the EFW, and less than 50 per cent of the feed to the thermal process is recycled. Also fails criterion 2 as the weight of the hazardous waste is greater than three per cent of the dry weight of the feed into the thermal process.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 5,000
2. Per cent moisture in waste (air dried at 60°C) M 25%
3. Weight of dry waste fed into the thermal process A = W - (W*M/100) A 3,750
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 0
6. Weight of solid products for recycling D 0
7. Weight of hazardous residue for disposal E 115

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$0/3,750 = 0.0$
2.	$E * 100 / A$	$115 \times 100/3,750 = 3.0$

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

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Example #5

A custom casting plant combines a special organic binder with sand to form moulds (three per cent by weight is binder). After multiple uses the sand becomes a waste; however, because of the leachable nature of the binder, the sand/binder mixture cannot be used in construction or as backfill. The sand can be reused after the binder is burned off and the sand rescreened.

The thermal process used for reclaiming the sand for this case is designed to process 8,500Kg/hr of the sand (8,250) and binder (250) mix. Fossil fuel is used in the thermal process to supplement binder heat input but is not considered a waste material so it is not included in the material balance. Rescreening produces on a dry basis, approximately two per cent of the weight of the original dry material as fines (170Kg/hr) and two per cent hazardous metals (170Kgm/hr), both requiring landfill disposal. As a result, 7,900Kg/hr of sand is recovered.

Criterion 1

Weight of material used as fuel	3%
Weight of material disposed of as waste	4%
Weight of material recycled or reused	93%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	2%
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Decision: Non incineration. Passes criteria 1 and 2 as the total weight of the material to be recycled is greater than 50 per cent of the total dry weight of the material fed into the thermal process (waste and fuel portion is seven per cent) and the weight of the hazardous residue is less than three per cent of the weight of the dry feed.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

- | | | | |
|----|--|---|-------|
| 1. | Weight of material defined by the MOEE as waste fed into the thermal processor | W | 8,500 |
| 2. | Per cent moisture in waste (air dried at 60°C) | M | 0% |
| 3. | Weight of dry waste fed into the thermal process
$A = W - (W * M / 100)$ | A | 8,500 |
| 4. | Weight of gaseous products for recycling | B | 0 |
| 5. | Weight of liquid products for recycling | C | 0 |
| 6. | Weight of solid products for recycling | D | 7,900 |
| 7. | Weight of hazardous residue for disposal | E | 170 |

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$7,900 / 8,500 = 0.93$
2.	$E * 100 / A$	$170 * 100 / 8,500 = 2.0$

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

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Example #6

A municipality wishes to redevelop some industrial land it owns for affordable housing after cleaning the soil left from a gasoline/home heating oil storage facility that once occupied the site. Sampling revealed that some of the residues cannot be cleaned through biological processes so it was decided to use low temperature incineration with the soil being returned to the site. The thermal processing unit handles 21,000Kg/hr of material with a 10 per cent moisture content. Spilled gasoline and part of the soil are burned off in the thermal process; the weight of the material burned off amounts to five per cent of the total weight of the soil on a dry basis. There is no hazardous waste produced.

Criterion 1

Weight of material used as fuel	5%
Weight of material disposed of as waste	0%
Weight of material recycled or reused	95%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	0%
---	----

Decision: Non incineration. Passes criteria 1 and 2. Can undergo approval process as total weight of material to be recycled is greater than 50 per cent of the total weight of the dry material fed into the thermal process (waste and fuel portion is five per cent) and the weight of the hazardous waste is less than three per cent of the total dry weight.

PROCESS EVALUATION SUMMARY FORM

The following process data comes from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

- | | | | |
|----|--|---|--------|
| 1. | Weight of material defined by the MOEE as waste fed into the thermal processor | W | 21,000 |
| 2. | Per cent moisture in waste (air dried at 60°C) | M | 10% |
| 3. | Weight of dry waste fed into the thermal process
$A = W - (W * M / 100)$ | A | 18,900 |
| 4. | Weight of gaseous products for recycling | B | .0 |
| 5. | Weight of liquid products for recycling | C | 0 |
| 6. | Weight of solid products for recycling | D | 18,000 |
| 7. | Weight of hazardous residue for disposal | E | 0 |

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$18,000 / 18,900 = 0.95$
2.	$E * 100 / A$	0

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

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Example #7

A metals recycling facility operates a high capacity shredding operation using scrap automobiles and white goods as feed material. Metals are recovered with the remaining material (shredder fluff) sent to disposal.

The company proposes to construct a thermal process to recover more metal from the 10,600Kg/hr of fluff by burning off the plastics, etc. Fluff is approximately nine per cent metal (900Kg/hr), 81 per cent burnable material such as plastics and upholstery (8,600Kg/hr), and 10 per cent moisture (1,100Kg/hr). The thermal process produces metals for recycling and a leachate toxic fly ash (400Kg/hr).

Criterion 1

Weight of material used as fuel	86.3%
Weight of material disposed of as waste	4.2%
Weight of material recycled or reused	9.5%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	4.2%
---	------

Decision: Incineration. Fails criteria 1 and 2 with the weight of materials for recycling being less than 50 per cent of the total dry weight of the materials fed into the thermal process and the weight of the hazardous residue being greater than three per cent of the total dry weight.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 10,600
2. Per cent moisture in waste (air dried at 60°C) M 10
3. Weight of dry waste fed into the thermal process A = $W - (W \cdot M / 100)$ A 9,500
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 0
6. Weight of solid products for recycling D 900
7. Weight of hazardous residue for disposal E 400

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$900 / 9,500 = 0.095$
2.	$E * 100 / A$	$400 \times 100 / 9,500 = 4.2$

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

Signature.

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Example #8

A cement company wants to use a refuse-derived fuel (21,000Kg/hr) with a 20 per cent moisture content to replace some of the coal used as fuel in their cement kiln. Testing in other jurisdictions indicates that a ratio of 4:1 clay/limestone mixture (as CaO) to dry RDF is the maximum allowable to produce a good product. Bottom ash (at a calculated 4,000Kg/hr or at a weight of 19 per cent of the dry material fed into the thermal process) is incorporated in the cement clinker, while fly ash (calculated at 170kg/hr or one per cent of the dry feed) is incorporated in the kiln dust and is not leachate toxic.

Criterion 1

Weight of material used as fuel	75%
Weight of material disposed of as waste	1%
Weight of material recycled or reused	24%

Criterion 2

Weight of residue defined as hazardous waste (schedule 3,4)	0%
---	----

Decision: Incineration. Fails criterion 1 as total weight of material to be recycled is less than 50 per cent of the total weight of the dry material fed into the thermal process.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

1. Weight of material defined by the MOEE as waste fed into the thermal processor W 21,000
2. Per cent moisture in waste (air dried at 60°C) M 20%
3. Weight of dry waste fed into the thermal process A 16,800
 $A = W - (W * M / 100)$
4. Weight of gaseous products for recycling B 0
5. Weight of liquid products for recycling C 0
6. Weight of solid products for recycling D 4,000
7. Weight of hazardous residue for disposal E 0

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$4000 / 16800 = 0.24$
2.	$E * 100 / A$	0

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

Signature.

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Example #9

A recycling company plans to use a thermal process to reclaim the metal content contained in a mixed scrap metal which has five per cent cutting and lubricating oils (100kg/hr). There is no moisture content. In the 2,100Kg/hr process, 200Kg/hr lead, 400Kg/hr zinc and 1200Kg/hr iron are recovered. The remainder (200Kg/hr) is a hazardous fly ash which is sent to landfill.

Criterion 1

Weight of material used as fuel	5%
Weight of material disposed of as waste	9%
Weight of material recycled	86%

Criterion 2

Weight of residue defined as hazardous waste	.9%
--	-----

Decision: Incineration - Process passes criterion 1 but fails criterion 2 as the weight of the material designated as hazardous waste is more than three per cent of the total weight of the dry material fed into the thermal process.

PROCESS EVALUATION SUMMARY FORM

The following process data come from the attached mass balance form (NOTE: Weights in Nos. 4 to 7 are on a dry basis):

- | | | |
|----|--|---------|
| 1. | Weight of material defined by the MOEE as waste fed into the thermal processor | W 2,100 |
| 2. | Per cent moisture in waste (air dried at 60°C) | M 0 |
| 3. | Weight of dry waste fed into the thermal process
$A = W - (W * M / 100)$ | A 2,100 |
| 4. | Weight of gaseous products for recycling | B 0 |
| 5. | Weight of liquid products for recycling | C 0 |
| 6. | Weight of solid products for recycling | D 1,800 |
| 7. | Weight of hazardous residue for disposal | E 200 |

The equations in the table below evaluate the proposed thermal process against the criteria outlined in the guidance document Determination of Thermal Processes Allowed Under Regulation 555/92 Incineration Ban.

Criterion No.	CRITERIA EQUATIONS	CALCULATED VALUE
1.	$(B + C + D) / A$	$1800/2100 = 0.86$
2.	$E * 100 / A$	$200 * 100/2100 = 9$

PROCESS WILL BE CONSIDERED TO BE AN INCINERATION PROCESS IF:

CRITERION NO. 1. $(B + C + D) / A < 0.5$ OR

CRITERION NO. 2. $E * 100 / A \geq 3$

Dated

Name.

Title.

Signature.

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APPENDIX E

APPROVAL GUIDANCE DOCUMENTS

Approval Guidance Documents

The following documents are available from the Approvals Branch to assist applicants for Certificates of Approval. They may be ordered by contacting:

Ontario Ministry of Environment and Energy
Approvals Branch
250 Davisville Ave. (3rd Floor)
Toronto
Ontario M4S 1H2
Attention: Information Officer
Telephone (416) 440-3718

1. GENERAL INFORMATION, CERTIFICATES OF APPROVAL, AIR, Section 9, *Environmental Protection Act*, R.S.O. 1990, Chapter E-19, Approvals Branch, August 1992.
2. GUIDE FOR APPLYING FOR CERTIFICATES OF APPROVAL, AIR, (SOURCES OF CONTAMINANTS) Section 9, *Environmental Protection Act*, R.S.O. 1990, Chapter E-19, Approvals Branch, September 1992.
3. GUIDE FOR APPLYING FOR CERTIFICATES OF APPROVAL, WASTE DISPOSAL SITES (LANDFILL, TRANSFER OR PROCESSING), Sections 27, 30, 31 and 32, *Environmental Protection Act*, R.S.O. 1990, Chapter E-19, Approvals Branch, September 1992.

